Manufacturing Growth and Liberalisation in India (1960-1999): A Demand Side Analysis*

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After Keynes, it has become usual to emphasise the prevalence of unused capacities across industries, sometimes even as result of deliberate microeconomic policy (Koutsoyiannis, p 272, 1975). This is why industrial growth is believed to be, by and large, demand led.

External demand for manufactured products is of four types: demand for investment goods, demand for consumer goods, demand for intermediate goods for other sectors, and export demand. This paper represents these four types of demand Gross Capital Formation (GCF), Private and Government Final Consumption Expenditure (PFCE, GFCE), Agricultural output, and finally exports. Liberalisation is treated as a regime change since 1991.

The study fitted a regression model to assess the influence of these demand side forces on manufacturing growth. This being done, the regression model was used to estimate the trend in manufacturing. This was done by estimating the trend in the various explanatory variables, and projecting the trend of manufacturing growth therefrom (using the regression coefficients). The paper tried to examine whether liberalisation affected the manufacturing trend.

Sources of Data:

Data on the variables was taken from Handbook of Statistics on Indian Economy, (RBI, 2001). In few cases where the figures before 1970 were unavailable from this source, they were extended backward by using data from CMIE, sometimes by splicing.

Methodology

All the variables were in constant prices. They were reduced to exponential growth rates (log-differences) in order to avoid the problem of spurious regression. Demand from the agricultural sector was proxied by the lagged value of agricultural growth rate. The lagged value was taken since it is well known that agriculture has a lagged effect on demand for industrial output (Rangarajan, 1982;

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Nagaraj, 1990, fn.12). The influence of Liberalisation was assessed by introducing dummies from 1991.

Regression Results:

In the first stage a preliminary regression was run on all the variables without dummies. The results are reported in Table 1. It was found that Government Final Consumption did not attract significant coefficients. In order to improve the precision of the remaining variables, it was dropped from subsequent regressions.

In the second stage, an intercept dummy as well as slope dummies for all four remaining variables were inserted from 1991. The results are reported in Table 2 in the Appendix. Slope dummies for lagged Agricultural growth and exports were not significant. In the final regression, the slope dummy for agriculture was dropped. However, the slope dummy for exports was retained, partly because it was significant at 15%, and also because it made theoretical sense to presume that liberalisation increased the sensitivity of manufacturing growth to the growth of exports.

Table 1: Preliminary Regression — Without dummies

	Coefficient	t	Significance
(Constant)	-2.23E-03	-0.188	0.852
Private Consumption growth	0.682	3.28	0.003
Govt. Consumption growth	8.30E-02	0.883	0.384#
Gross Capital Formation growth	0.213	3.36	0.002
Export Growth	0.113	2.216	0.034
Lagged Ag. Growth	0.235	3.06	0.004

not significant,

The final regression was run with the form:

$$MG = \text{Constant} + \text{dummy91} + AGGR_{-1} + \text{Export growth} + {}_{91}\text{d91EXP} + \text{GCF growth} + {}_{91}\text{GCF} + \text{PFC growth} + {}_{91}\text{PFC} \quad \ldots [1]$$

Where: $AGGR_{-1}$ = Lagged Agricultural growth rate

EXP = Export growth rate

GCF = growth rate of Gross capital formation

PFC = growth rate of private final consumption expenditure

Coefficients

The results of the final regression were as shown in Table 3. The DW statistic lay in the indeterminate zone. Hence the autocorrelation chart of the residuals was examined (reproduced as Fig 3 in the appendix). The chart did not rule out the hypothesis of the residual being white noise.

Table 3: Final Results

		t	Significance
(Constant)	1.26E-02	1.378	0.179#
Dummy 91	-0.108	-3.448	0.002
Lagged Ag. Growth	0.234	3.517	0.001
GCF growth	0.179	2.739	0.01
D91GCF	0.247	2.106	0.044
Export growth	0.107	2.282	0.03
D91EXP	0.24	1.58	0.125#
PFC growth	0.532	2.607	0.014
D91PFC	1.373	2.96	0.006
R^2 = .719	df =29	DW=1.853	

not significant

The results indicate that 72% of the variation in manufacturing growth was explained by the regression. Figure 1, drawn overleaf, shows that the estimates from regression equation tracked manufacturing growth fairly well, especially after the mid 80s.

All but two of the regression coefficients were significant at 5% level. Although the intercept, and the slope dummy of exports were not significant, they were retained in the regression in order to improve the precision of the other results. Furthermore, it was plausible that manufacturing growth became more sensitive to export growth after 1991.

The slope dummies of export, gross capital formation, and private final consumption were all positive. This indicated a structural shift in the behaviour of Manufacturing Growth after 1991.

The summary finding of the regression for the **pre-liberalisation phase**: 1963-99 may be stated as follows:

MANGR. = 0.0126 + .23(AGGR) + .11(EXP) + .18(GCF) + .53(PFC) . . . [2]

Before 1991, a percentage point increase in Private Consumption caused a ½ percentage point increase in manufacturing growth.

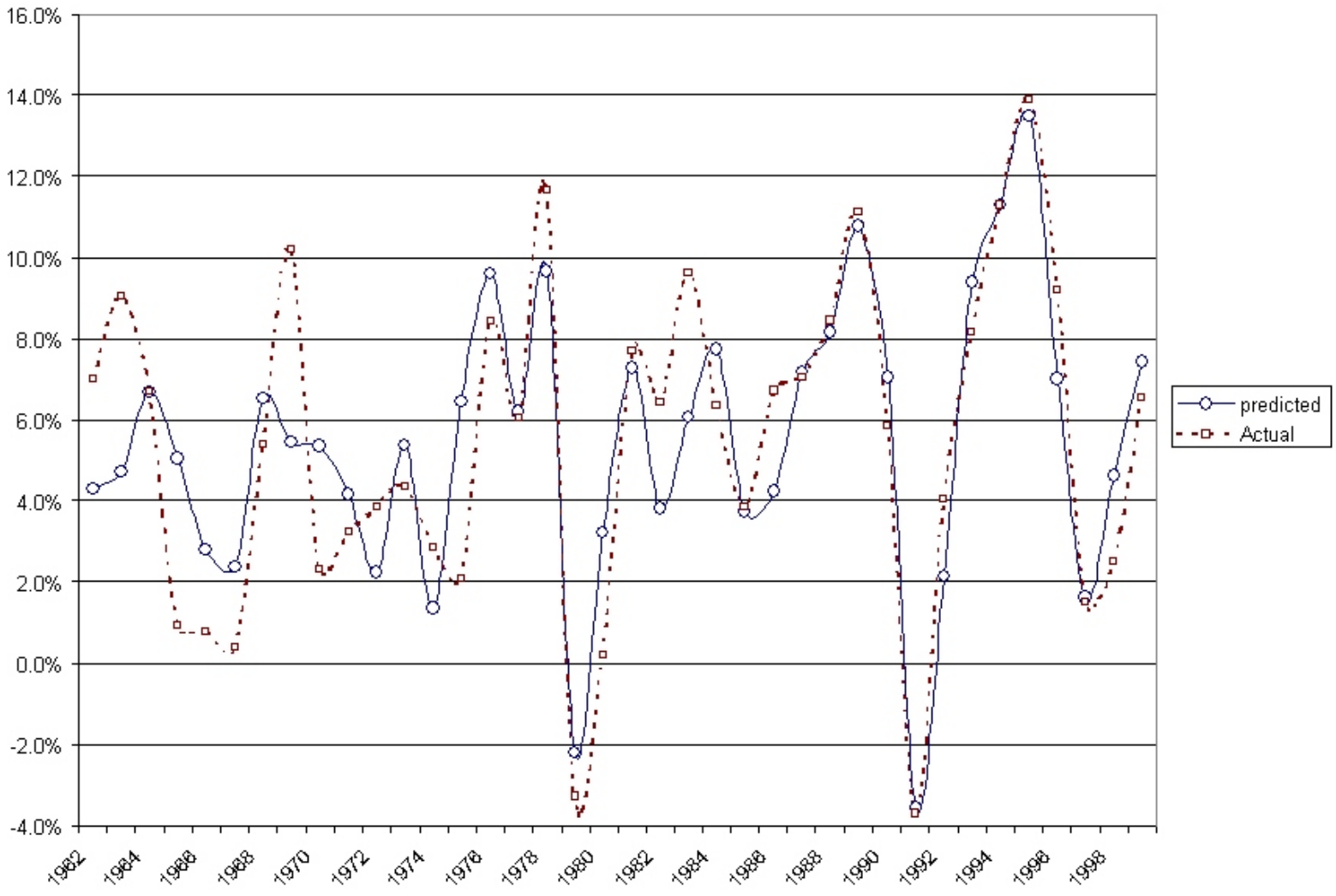
A percentage point increase in agricultural, export and GCF growth caused an increase in manufacturing growth by .23, .11, and .18 percentage points, respectively.

The summary findings of the regression analysis for the **post-liberalisation period**: 1991-99, may be stated in the equation form as follows:

MANGR. = 0.095 + .23(AGGR) + .347(EXP) + .426(GCF) + 1.905(PFC) . . . [3]

Equation [2] implies that an increase in Private Consumption by 1 percentage point is likely to increase manufacturing growth by nearly 2 percentage points! An increase in GCF, Exports and agricultural growth by one percentage point is likely to increase manufacturing growth by .43, .35 and .23 percentage points respectively.

Figure 1. Manufacturing Growth in India 1962-99



A key finding of the regression is the heightened sensitivity of manufacturing growth to the growth in private final consumption expenditure, in the post-liberalisation phase.

Since the intercept dummy, as well as slope dummies of three out of four variables tested significant, it is worth inquiring whether the structural change in the responses of manufacturing growth after 1991, also resulted in a break in the trend.

Estimating the Industrial Trend

The following method was used to estimate the trend in manufacturing:

Figure 2. Trend in Manufacturing Growth 1962-99

The manufacturing trend was projected by using the regression coefficients together with the trend values of the explanatory variables. To estimate the trend values of the four explanatory variables, cubic and exponential curves were fitted

on the absolute values. The cubic functions provided a closer fit in all cases. The figures are reproduced in the appendix as Figure 3.

The trend values of the four variables predicted by the cubic functions were then combined with the regression coefficients to project the trend in manufacturing output. This mode of measuring trend is inspired by Kalecki, who visualised trend as a slowly changing component of short run variations (Feiwel G., 1975).

Figure 2, drawn overleaf, shows the trend estimates of manufacturing growth. It seems from the figure that the trend in manufacturing divides into two clear phases. The first phase lasting till 1980 was a **low trend** phase, with a trend value of less than 5%. Indeed the average of actual annual (exponential) growth rates from 1961-80 was c 4.2%. 1982-1999 seems to be a **high trend** phase, with a trend of over 6% p.a.. The arithmetic average of the actual annual growth rates of manufacturing of this period was about 6.7%.

In the year 1991, the manufacturing trend shows a slight but a very insignificant break in the trend. Thus, it seems plausible to infer that there was no break in the trend in manufacturing after 1991. The high trend in manufacturing witnessed after 1991, is a continuation of the high trend ushered in after 1982, and cannot be attributed to liberalisation.

Conclusions

The trend in manufacturing has not shifted post-91. Liberalisation shares in the high trend phase in manufacturing, that was ushered in after 1981, which continued even after 1991.

Liberalisation however, seems to have changed the structure of demand responses of manufacturing output. In contrast to pre-liberalisation years, after 1991, manufacturing growth seems to have become highly sensitive to growth in personal consumption expenditure. After 1991, a one percentage point increase in personal consumption expenditure seems to change manufacturing growth by nearly 2 percentage points!

Liberalisation also seems to have increased the responsiveness of manufacturing growth to fluctuations in growth of gross capital formation and exports. However, the increase in responsiveness to changes in export growth is not statistically significant.

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